Analysis of the electrical parameters of electroluminescent lighting in the lobby of an office building

Łukasz Putz*, Dorota Typańska**

*Faculty of Electrical Engineering, Poznan University of Technology, Piotrowo street 3A, 60-965 Poznan, Poland,
e-mail: *Lukasz.Putz@put.poznan.pl, **Dorota.Typanska@put.poznan.pl

Abstract **In the paper analyzed levels of higher harmonics of voltage and current, which generates a light installation in the lobby of an office building. In the luminaires were used as a source light emitting diodes. These measurements allowed to determine which elements of the lighting system cause the most disruption. Of these elements will be carried out further investigations.**

Keywords **energy quality, higher harmonics, LED technology, lighting installation.**

I. INTRODUCTION

Luminaires with light emitting diodes (LED) are highly suitable for designing lighting systems of representative room. Such a room could be an office building lobby. Unfortunately, semiconductor light sources (although they give a beautiful visual feelings) are not as good from the electricity side, which will be presented in the article.

II. LED INSTALLATION DATA

The total power installed of lighting system in the lobby is 720 W (700 W - light sources, 20 W - power supply and control system). The total current of system is 5 A. The system has a capacitor character and provides a small phase shift between voltage and current - the power factor is cosφ = 0,99. Detrimental to the circuit is peak ratio of the current signal, which is CF = 3,05. This means that the current signal is quite deformed from a sinusoid (*fig. 1*). Therefore, the system will generate a higher harmonic of current.

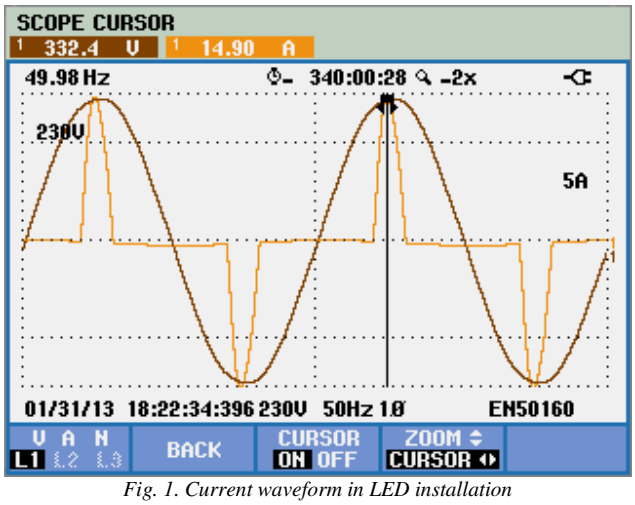

Fig. 1. Current waveform in LED installation

III. LED INSTALLATION MEASUREMENTS

The research has been performed for several state of lighting installation. In the first case the measured electrical parameters including the higher harmonic voltage and current to a fully enabled system. When the power system about 1 kW can observe a large distortion of current (*fig. 1*). As a result, the harmonic content of the current is very large and is about THD ≈ 80% (*fig. 2*). In the second case measured electrical grid parameters only. The third measure consisted of measuring the parameters of the supply and control system of the electroluminescent lamps. The content of the current harmonics was a little smaller than the system at full load (THD ≈ 70%). It follows that the harmonics are generated mostly by power supply of LED lamps. Current distortion cause an increase in harmonics of voltage from 1,1 to 1,3%.

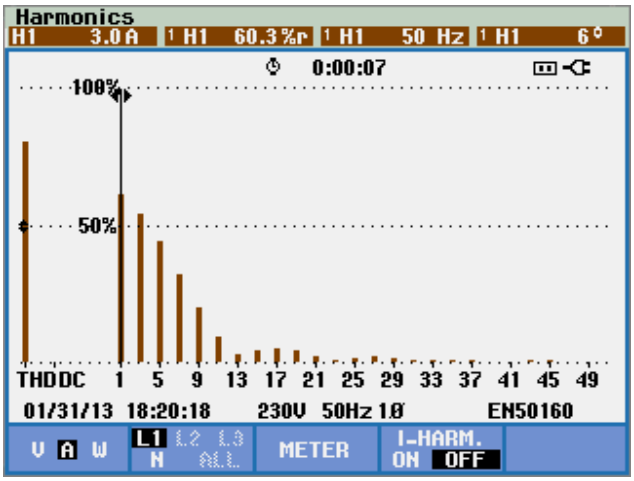

Fig. 2. Current harmonics in LED installation

IV. CONCLUSION

In the case of much higher power LED lighting system, voltage distortion generated to the power grid are so large that they can cause serious damage in the devices connected to the power grid.

V. REFERENCES

[1] Putz Ł.: "Influence of power suplies and drivers on electroluminecsent light sources working", Procedings of XXXV SPETO Conference, Gliwice-Ustron 2012, pp.: 67-68.

[2] Putz Ł., Jarmuda T.: "The problem of higher harmonics in the design of electrical lighting systems", Electrical Engineering Academic Journal No. 67-68, Poznan 2011, pp.: 19-29.

[3] Putz Ł., Nawrowski R.: "Energy efficiency analysis of lighting installations using LED technology", Electrical Review No. 06/13, Warsaw 2013, pp.: 296-298.